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EVALUATION OF DAMAGE TO CHRISTMAS TREES ON THE MI-WOK RANGER DISTRICT, STANISLAUS NATIONAL FOREST

PSW FOREST AND RANGE
EXPERIMENT STATION

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ABSTRACT

The authors explored several possible causes of excessive needle loss from white fir Christmas trees purchased on the Santa and White Sales. Since insect and disease pests and improper handling were substantially ruled out, we concluded that below-freezing temperatures and severe winds may have been responsible for the damage. In an unrelated problem, we found that poor streamside drainage was predisposing lodgepole pines to a needlecast disease at Hull Creek Spring.

On December 11 and 12, 1983, Forest Pest Management (FPM) received two pest detection reports describing excessive needle loss from white firs cut from a Forest Service-administered Christmas tree sale. According to Lyle Tallent, Mi-Wok District Small Sales Officer, white firs cut around November 24th had lost most of their older needles from the lower two-thirds of their crowns by December 3-6. Subsequently, trees cut from an adjacent part of the Wrights Creek Timber Sale were found to have suffered similar needle loss, rendering them unsalable. Prior to visiting the site, we speculated that there might be three possible causes of this condition:

- insect, disease, or vertebrate pest problems prior to the sale;
- climatic events before or during cutting;
- improper handling after cutting.

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At the request of District Ranger William Holland, we visited the District on December 19, 1983. We examined several cut white firs and visited the Santa, White, and Little Sweden Christmas tree sales. We also evaluated the causes of an unrelated pest problem of lodgepole pine at Hull Creek Spring.

SANTA AND WHITE CHRISTMAS TREE SALES

LABORATORY OBSERVATIONS

The first branch samples sent to FPM were dry and missing most of their older needles; only the current year's needles were still firmly attached to the twigs. There was no evidence of insect feeding or of fungal fruiting bodies on any of the samples. Most notably, the branches and twigs were dessicated and the few remaining older needles were shriveled.

The second white fir samples were from a stand about one mile from the Christmas tree sale area, and were infected by true fir needle cast, which is caused by the fungus Lirula abietis-concoloris. This fungus attacks the current year's needles, but does not become obvious until the second year, when the needles turn brown and distinctive black fruiting bodies appear on the upper and lower needle surfaces. Usually only one year's needle complement is affected, since the fungus seldom infects trees two years in a row. Although most or all of the second year's needles may be killed by the fungus, third year's and older needles remain unaffected.

FIELD OBSERVATIONS

The Santa Sale, comprising 250 white firs, was cut between November 24th and December 2nd; individual buyers of these trees began to return them in early December because of excessive needle loss. The White Sale, comprising 300 white firs, was cut between November 19th and December 8th; the first trees were returned to the seller around December 10th. On November 10th a light brushing of snow fell in the area, and a week later the first major snow fell; prior to this, the fall weather had been rainy and warmer than usual. During the time of cutting, temperatures were frequently below freezing, reaching 20°F on November 24th and 27th. On November 17th and again on December 3rd the sale area was buffeted by winds up to 70 miles per hour. On December 2nd temperatures grew somewhat warmer.

At Mi-Wok on December 19th we examined two white firs that had been bought and then returned to the seller. Both trees had lost most of their older foliage in the lower two-thirds of their crowns, and were dry and very light. Normally, trees are this dry only after they have been in heated houses for several weeks. We next visited the residence of the Santa Sale purchaser, where we examined six white firs that had

been stored there because they were judged to be unsalable the day after cutting. Although not as dry as the first two firs, these trees had lost a considerable amount of foliage from their lower crowns.

We then drove to the North Fork Timber Sale area, near the intersection of roads 30N60 and 3N01 and about one mile from the Santa and White Sales. The needle cast specimens sent to FPM on December 12th were collected at this site, but none of the afflicted Christmas trees were harvested here. Lirula abietis-concoloris was abundant on the white fir reproduction, especially where the affected saplings were growing beneath a sawtimber overstory. Most of the second year's needles had turned brown and the black fungal fruiting bodies were highly visible. The presence of the disease in the most severely-affected stand was unmistakable, even from a distance. In the more open stand, the disease was less visible, with only one or two needles in each 1982 internode having fruiting bodies of the fungus. There was no evidence that the third year's needles had been infected in 1982.

We next examined the Santa and White Sales. The mixed ponderosa pine-white fir-sugar pine stand is located at about 4800 feet elevation near the lower limit of winter-long snow. The stand was cut over and planted to pine about 15 years ago, and white fir seeded in thickly in many places. One-half to 1-1/2 feet of snow were on the ground. The firs marked for sale as Christmas trees were generally over five feet tall, growing on the perimeter of clumps, and possessing full, symmetrical crowns. There were numerous large stumps, but no evident root disease centers. True fir dwarf mistletoe was present on about 15% of the trees, but the infection was generally slight. Only one fir was found to be infected with true fir needle cast; very few needles were affected.

In general, the firs had the appearance of winter yellows, a yellowing or chlorosis of the needles caused by the breakdown of chlorophyll during the winter; the condition is normal in cold weather and the needles recover their green color after warm weather returns in the spring. Green needles were lying on the snow beneath many of the trees, indicating that they had been cast since the last snowfall. Several cut trees, which were marked with flagging, were lying on the snow where they had been discarded by the purchaser. These had suffered some needle loss also, but were still acceptable as Christmas trees. We noted that the older, lower crown needles of many of the cut firs were markedly curled, but no insects or fungi appeared to be responsible; moisture deficiency can cause similar symptoms on living conifers. We collected two cut firs, which had lain on the site for at least two weeks, to take back to the Bay Area for observation. We also cut a third, unmarked tree for comparison with the two cut trees.

Finally, we visited the Little Sweden Sale, which had been cut on November 17th, just before the first major snowfall of the season. The cut trees were examined in the lot on December 13th and found to be undamaged. Other than that the firs were cut before the worst of the cold, windy weather, there was nothing visible on the ground to indicate

that conditions on this site were more favorable than those at the Santa and White Sales. If anything, the firs on the Little Sweden Sale appeared to have sparser crowns.

DISCUSSION AND CONCLUSIONS

Among the possible causes of excessive needle loss, insect, disease, and vertebrate pests were substantially ruled out by our laboratory and field observations. Although true fir needle cast is present nearby, the amount of disease observed in the White and Santa Sales was insufficient to cause the needle loss. Furthermore, the pattern of needle loss, with the oldest needles dropping first, is inconsistent with the typical pattern of disease progress. Below-ground causes of stress -- including root disease, gopher feeding, and mineral deficiencies -- might so weaken trees that they would dry rapidly after being cut, but on-site observations show that mortality has been low and the living firs are growing well. Comparison of these Sales with the Little Sweden Sale suggests that these trees were not under any undue stress prior to being marked.

Improper handling and storage have been ruled out by District people who looked into the matter. This leaves another possibility: a combination of climatic events before or during cutting that dessicated the trees. Although we can only speculate as to what really happened, one plausible answer is that the trees suffered a condition known as **winter drying**, brought on by a rapid drop in temperatures and unusually strong winds. When excessive transpiration -- induced either by sunlight, warm air temperatures, or strong, drying winds -- occurs while the ground is very cold or frozen, tree roots may be unable to replace the moisture lost from the foliage. The tree then suffers a condition similar to drought, with the older needles dropping first. We cannot say for certain that the low daytime temperatures and high winds during the time of cutting were sufficient to cause winter drying, but we can say that the symptoms we observed, including loss of older needles, shriveled foliage, and dry, light branches and stems, are consistent with some form of dessication, which could have been caused by winter drying.

The three trees that we took back to the Bay Area did not suffer exactly the same symptoms as the firs at the Ranger Station. We transported the trees in an enclosed truck, and stored them in the shade, without water, for one month. The two trees that were cut six weeks earlier lost very few needles, while the tree that was cut on December 19th lost about one-half its needles in the lower one-third crown. We do not know why these trees lost fewer needles and remained fresher than did other trees from the same sale.

LODGEPOLE PINE NEEDLE CAST AT HULL CREEK

Many of the lodgepole pines in the creek bottom east of the campground are suffering from a severe infection of lodgepole pine needlecast, caused by Davisomycella montana. The disease is common in this vicinity and is generally not a severe problem. However, the plugging of the

culvert two years ago has caused considerable flooding, which alters the microclimate and further stresses the pines, making them more susceptible to the needlecast. The white firs in the creek bottom have been killed, and some mountain pine beetle attacks are visible on the pines. Alleviating the flooding will make the site less favorable to the fungus and reduce the stress on the pines, and may prevent a mountain pine beetle outbreak and subsequent mortality.